

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Claims 5, 8, 14, 23, 27, 33, 36, 44, 45, 49, 59, 60 and 64 are currently being amended.

Claims 76-81 are being added.

Claim 59 has been rewritten in dependent form to depend from Claim 76.

After amending the claims as set forth above, Claims 1, 2, 4-11, and 13-81 are now pending in this application, of which Claims 1, 5, 8, 10, 19, 29, 37, 44, and 76 are independent.

New Claims

Claims 76-81 have been added. Claim 76 recites “selecting which values to use to provide a value for the defective pixel for the first image based on characteristics of the first image.” None of the references cited during prosecution teach or suggest this element. For instance, Granfors instead teaches selecting which pixels will provide pixel values to be used to provide a value for the defective pixel in a particular (first) image before that particular image is obtained. Granfors teaches that the pixels to be used are pre-selected during a calibration procedure based on a predetermined selection order unrelated to any characteristic of a particular image. Col. 4, lines 41-46 and 54-55.

Watanabe also fails to teach selecting which values to use to provide a value for the defective pixel for the first image based on a characteristic of the first image. Rather, Watanabe teaches using pre-selected pixels to correct the defective pixel based on their location with respect to the defective pixel and not based on a characteristic of a particular image. See Col. 14, lines 36-42 and Col. 15, lines 1-5.

Further, this feature taught in the present application and claimed in Claim 76 is not an obvious variation of prior systems which use pre-selected pixels rather than choosing pixels to use based on the characteristics of the particular image obtained. In comparison to

at least one such prior system, the present system is able to generate significantly better results as can be seen by comparison of Figure 8 (the prior system) and Figure 9 (a system implementing this feature of Claim 76) of the present application.

Claims 76-81 are supported by the specification. Claims 76-78, 80, and 81 are supported in a similar manner as Claims 5, 14, 23, 33, 44, and 59. Further, Claims 76-78, 80 and 81 are supported by the disclosure at page 8, lines 16-21; at page 2, lines 5-7; and at page 7, lines 9-23 and the remainder of the discussion of Fig. 3. Claim 79 is supported in a similar manner as Claims 8, 27, 36, 46, and 61. Further, Claim 79 is supported in the disclosure at page 7, lines 3-6.

Rejections under 35 U.S.C. § 102

On page 5 of the Office Action, Claims 1, 2, 5, 8-11, 14, 17-21, 23, 26-31, 33, 36, 44-47, 50-52, 56, 57, 59-62, 65-67, 71, 74, and 75 were rejected under 35 U.S.C. § 102(b) as being anticipated by Granfors (U.S. 5,657,400).

A. Claims 1, 10, and 29

Claim 1 was rejected on page 5 of the Office Action. Claim 1 recites “wherein at least a portion of the array of pixel values comprises a matrix, and includes the defective pixel as a center matrix element and each surrounding neighboring pixel of the defective pixel as additional matrix elements.” The disagreement between Applicants and the examiner with respect to Claim 1 appears to relate to the requirements of Claim 1, and not to the application or teachings of Granfors.

On page 2 of the Office Action, the examiner states, with respect to Claim 1, “claim language does not recite a two-dimensional array of pixels or a two-dimensional local gradient matrix.” Applicants respectfully disagree. Claim 1 recites that the array includes “each surrounding neighboring pixel of the defective pixel as additional matrix elements.” For a defective pixel in a corner of an image, the array must be at least a 2x2 array in order to accommodate *each* pixel next to the defective pixel, and must minimally be a 3x3 array to

encompass *each* pixel next to a defective pixel when the defective pixel is in a middle region of the image. Thus, Claim 1 recites a two-dimensional array of pixels.

As recognized by the Office Action, Granfors teaches only the use of two neighboring pixels which are arranged linearly (i.e. a 1 x 3 arrangement). See page 6 of the Office Action. Thus, Granfors does not teach at least this element of Claim 1. Withdrawal of the rejection of Claim 1 as anticipated by Granfors is respectfully requested.

Claims 10 and 29 recite an element similar to that discussed above for Claim 1 and would be allowable for reasons similar to those discussed above for Claim 1.

B. Claims 5, 14, 23, 33, 50, and 65

The rejection of Claim 5 was discussed on page 6 of the Office Action. Claim 5 recites “wherein step (b) of providing a correction value includes at least one of a linear interpolation and a weighted average of pixel values corresponding to pixels selected based on a determination that they had the highest local gradient.”

The Office Action argues that the pixels bordering the defective pixel have the highest local gradient matrix elements, Granfors teaches using up to two pixels bordering the defective pixel, and therefore Granfors teaches using a linear average of the highest local gradient elements.

Applicant respectfully disagrees that Granfors teaches using a linear average of the highest local gradient elements. Granfors teaches using pixel values from two of the eight pixels bordering the defective pixel whether or not one of those two pixels has the highest gradient of the eight pixels surrounding the defective pixel.

Claim 5 has been amended to clarify that Claim 5 requires that at least two pixels are chosen based on a determination that they have the highest gradient of the local matrix elements. Amended Claim 5 is believed to have at least the same breadth of scope as before the amendment made in this response, but has been made due to an apparent limitation in the English language for conveying this scope.

Granfors does not teach or suggest a linear interpolation of pixel values corresponding to pixels selected based on a determination that they had the highest local gradient. Rather, Granfors uses a predetermined pair of pixels without determining whether they had the highest gradient of the local matrix elements. Withdrawal of the rejection of Claim 5 is respectfully requested.

Claims 14, 23, 33, 50, and 65 recite an element relatively similar to that discussed above for Claim 5 and would be allowable for reasons similar to those discussed above for Claim 5.

C. Claims 8, 27, 36, 46, and 61

Rejection of Claim 8 is discussed on page 6 of the Office Action. Claim 8 (as amended) recites “replacing temporarily the defective pixel with a temporary value based on a linear interpolation of a surrounding neighboring pixels of the defective pixel before the determining step (a) such that determining the local gradient comprises determining the local gradient using the temporary value of the defective pixel.”

Granfors does not teach replacing the defective pixel with a temporary value such that determining the local gradient comprises determining the local gradient using the temporary value of the defective pixel. Rather, Granfors teaches not using a value of the defective pixel in the gradient calculation cited in the Office Action at all, let alone a linear interpolation as recited in Claim 8. Since Granfors does not teach at least one element of Claim 8 (as amended), Claim 8 is believed to overcome the rejection based on Granfors.

Claims 8, 27, 36, 46, and 61 recite an element relatively similar to that discussed above for Claim 8 and would be allowable for reasons similar to those discussed above for Claim 8.

D. Claim 19

The rejection of Claim 19 is mentioned on page 7 of the Office Action, but is more thoroughly handled on page 3 of the Office Action. It is the examiner’s position that Claim 19 should not be addressed under 35 U.S.C. § 112 since Claim 19 “does not recite specific

components for performing functions associated with steps in Fig. 3.” It is further the examiner’s position that even if Claim 19 were to be addressed under 35 U.S.C. § 112, Granfors achieves substantially the same function in substantially the same way to produce substantially the same result.

With respect to the examiner’s contention that Claim 19 should not be addressed under 35 U.S.C. § 112, sixth paragraph, Applicants respectfully disagree. This section states that “an element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof.” Claim 19 recites a “means for determining a local gradient” which clearly falls within the scope of 35 U.S.C. § 112, sixth paragraph. The examiner’s desire to have structural elements cited in the claim are expressly not required by this section of the statute.

With respect to the examiner’s contention that Granfors achieves substantially the same function in substantially the same way to produce substantially the same result, Applicants respectfully disagree. As one example, Granfors et al. does not show a processor 20 configured to perform any one of the embodiments described with respect to step 46 of Fig. 3, and would thus not perform the function of “determining a local gradient” in the same way. Further, each of the embodiments discussed with respect to step 46 is significantly more complicated than the simple averaging of two values disclosed in Granfors, and would thus not perform the function of “determining a local gradient” in substantially the same way. Withdrawal of the rejection of Claim 19 is respectfully requested.

E. Claim 44

Claim 44 recites “providing a pixel value for the defective pixel using the first, second, and third pixel values.” Granfors does not disclose using first, second, and third pixel values to provide a pixel value for the defective pixel. Rather, Granfors teaches “the first combination would preferentially be used. However, if either of the pixels to be used for calculating the new pixel value were also bad, the next combination would be used, and so forth.” Col. 4, lines 47-50. In other words, despite the fact that each of the eight values could potentially be used, only a single combination is ever used.

The Office Action argues that “the broad claim language does not recite a particular combination of the three pixel values simultaneously.” While the claim language is not limited to a particular combination or method of using the three values, it is limited to providing a pixel value for the defective pixel using all three of selected pixels in some form. Granfors does not teach using three values, selected based on some analyzed characteristic of the pixel, to provide a pixel value for a defective pixel. Withdrawal of the rejection of Claim 44 is respectfully requested.

F. Claims 45 and 60

Claims 45 and 60 recite limitations similar to (although not the exact same as) Claim 5 and are believed to be allowable over Granfors for reasons similar to those discussed above with respect to Claim 5.

Specifically, Claim 60 recites “selecting a first pixel of the plurality of pixels having a first pixel value based on the analyzed characteristic of the first pixel; selecting a second pixel of the plurality of pixels having a second pixel value based on the analyzed characteristic of the second pixel ... wherein the analyzed characteristic comprises a gradient of the pixel being analyzed.” Granfors does not teach selecting a pixel value to be used in providing a pixel value for a defective pixel based on a gradient of the pixel corresponding to the pixel value. Rather, Granfors teaches selecting a pixel value based on a predetermined selection order and based on which of the pixels in the predetermined selection order are defective. See Col. 4, lines 41-46.

Claim 45 recites an element similar to Claim 60 and is believed to be allowable for similar reasons.

G. Claim 59

Rejection of Claim 59 was addressed on page 10 of the Office Action. Claim 59 depends from Claim 76 and is believed to be allowable for reasons similar to those discussed above for Claim 76.

Further, Claim 59 recites “analyzing a characteristic of each of a plurality of pixels, the characteristic for each of the plurality of pixels based on pixel values of the image; selecting a first pixel of the plurality of pixels having a first pixel value based on the analyzed characteristic of the first pixel; selecting a second pixel of the plurality of pixels having a second pixel value based on the analyzed characteristic of the second pixel; and providing a pixel value for the defective pixel using the first and second pixel values.”

Granfors does not teach selecting a first pixel value and a second pixel value based on analyzed characteristics of a first pixel and a second pixel in the image. Rather, Granfors teaches using a predetermined pixel based on a predetermined selection order and based on which of the pixels in the selection order is defective. See Col. 4, lines 41-46.

H. Claims 2, 9, 11, 17, 18, 20, 21, 26, 28, 30, 31, 47, 51, 52, 56, 57, 62, 66, 67, 71, 74, 75

The remaining claims rejected as anticipated by Granfors each depend from at least one of the claims discussed above and would be allowable for at least the same reasons as discussed above for the claim from which the particular claim depends.

Rejections under 35 U.S.C. § 103

A. Rejection of claims as being unpatentable over Granfors

On page 11 of the Office Action, Claims 4, 6, 13, 15, 22, 24, 32, 34, 37-43, 48, 63, and 73 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Granfors (U.S. 5,657,400).

1. Claims 4, 10, and 32

Claim 4 depends from Claim 1 which recites “wherein at least a portion of the array of pixel values comprises a matrix, and includes the defective pixel as a center matrix element and each surrounding neighboring pixel of the defective pixel as additional matrix elements.” As discussed above with respect to anticipation, Claim 1 requires at least a two-dimensional

array which is not taught or suggested by Granfors. Thus, withdrawal of the rejection of Claim 4 is respectfully requested.

Claims 10 and 32 recite elements similar to Claim 4 and are allowable for reasons similar to Claim 4.

2. *Claims 6, 15, and 34*

Claim 6 depends from Claim 5 which recites “wherein step (b) of providing a correction value includes at least one of a linear interpolation and a weighted average of pixel values corresponding to pixels selected based on a determination that they had the highest local gradient.” As discussed above with respect to anticipation, Granfors does not teach or suggest a linear interpolation of pixel values corresponding to pixels selected based on a determination that they had the highest local gradient.

3. *Claim 37*

Applicants wish to reiterate the argument filed in response to the previous Office Action. The examiner continues to argue that one of ordinary skill in the art would have been motivated to modify Granfors based on knowledge of the existence of larger filters which take into account global characteristics of the image to achieve better results. This motivation is clearly not accurate since at least Granfors and Schreiner (U.S. 5,617,461) each explicitly recognize the existence of these larger filters, but were not motivated to use or even suggest the use of such filters. Thus, it appears that even Granfors was not motivated as the examiner suggests. The examiner is respectfully requested to review his position with respect to the proposed motivation to combine.

The argument filed in response to the previous Office Action is repeated below:

With respect to Claim 37, the examiner appears to argue that 1) Granfors et al. teaches that a defective pixel value should be corrected, 2) filters such as 5 x 5 and 7 x 7 filters which take into account global characteristics are well known in the art, 3) that the well known filters of point 2 are known to provide better results, 4) that one of ordinary skill in the art

would have been motivated to use the filters of point 2 to achieve better results for the corrected value, and 5) Granfors et al. as modified in view of point 2 and motivated by point 4 suggests the invention claimed in Claims 37-43.

While there may be disagreement on other points, the primary point of disagreement between Applicants' representative and the examiner is regarding point 4. The proposed motivation cited in point 4 is not stated in any of the references and appears to be contradicted by the disclosure of the patents relied on by the examiner. Specifically, Granfors et al., at Col. 3, line 56 to Col. 4, line 11, recognizes that the filters recited in point 2 exist and applies those filters to determine which pixels are defective. Subsequently, at Col. 4, lines 38-46, Granfors et al. applies a simple linear interpolation of values to correct the defective pixel value. In other words, despite the clear showing that Granfors et al. was aware of the filters of point 2 and was aware that these filters could be applied to x-ray detector images, Granfors et al. did not apply them to correct the defective pixel value. If point 4 of the examiner's argument was accurate, it seems counter-intuitive that Granfors et al. did not apply those filters to correct the defective pixel. Granfors et al.'s use of the linear interpolation as described at Col. 4, lines 38-46 tends to suggest that one of ordinary skill in the art was not motivated to apply the filters of point 2 to correct a defective pixel value of an x-ray image.

This same logic can be applied to U.S. Patent No. 5,617,461 to Schreiner cited by the examiner during the interview to support his position. At Col. 3, lines 25-37 Schreiner teaches using a 31 x 31 kernel to identify which of the pixels of the x-ray detector are defective. Then, at Col. 3, lines 54-56, Schreiner teaches that the value for the defective pixel can be corrected by "a linear interpolation of adjacent image points." Again, the fact that Schreiner recognizes the existence and applicability of larger filters (here a 31 x 31 filter) for identifying a defective pixel and then only applies a linear interpolation of adjacent image points suggests that one of ordinary skill in the

art was not motivated to apply the larger filters to correct a value of a defective pixel, and that point 4 is inaccurate.

4. *Claim 48*

Claim 48 depends from Claim 45 which recites that a pixel is selected based on its gradient to provide a value used to provide a pixel value for the defective pixel. As discussed above, Granfors does not select a pixel based on its gradient to provide a value used to provide a pixel value for the defective pixel, but rather teaches selecting a pixel value based on a predetermined selection order and based on which of the pixels in the predetermined selection order are defective. See Col. 4, lines 41-46. Withdrawal of the rejection of Claim 48 is respectfully requested.

5. *Claim 73*

Claim 73 depends from Claim 59 which recites “analyzing a characteristic of each of a plurality of pixels, the characteristic for each of the plurality of pixels based on pixel values of the image; [and] selecting a first pixel of the plurality of pixels having a first pixel value based on the analyzed characteristic of the first pixel.” As discussed above, Granfors does not teach selecting a first pixel of the plurality of pixels having a first pixel value based on the analyzed characteristic of the first pixel where the characteristic for the first pixel is based on pixel values of the image received from the detector. Rather, Granfors teaches selecting which pixels will be used to provide a value for the defective pixel before a particular image is obtained based on a predetermined selection order and based on whether a particular pixel is defective (a property of the detector). Col. 4, lines 41-46 and 54-55.

Selecting a pixel to be used in providing a value for the defective pixel based on a predetermined order and before the image is obtained is not the same as or an obvious variation of selecting a pixel to be used in providing a value for the defective pixel based on pixel values of the image obtained.

B. Rejection of claims as being unpatentable over Granfors in view of Watanabe

On page 14 of the Office Action, Claims 7, 16, 25, 35, 53-55, 58, 68-70, and 72 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Granfors (U.S. 5,657,400) in view of Watanabe et al. (U.S. 5,854,655).

1. 7, 16, 25, and 35

Claim 7 depends from Claim 5 which recites “wherein step (b) of providing a correction value includes at least one of a linear interpolation and a weighted average of pixel values corresponding to pixels selected based on a determination that they had the highest local gradient.” As discussed above with respect to anticipation, Granfors does not teach or suggest a linear interpolation of pixel values corresponding to pixels selected based on a determination that they had the highest local gradient.

Additionally, Watanabe does not teach or suggest a linear interpolation and/or a weighted average of pixel values corresponding to pixels selected based on a determination that they had the highest local gradient. Rather, Watanabe uses predetermined pixels based on their location with respect to the defective pixel. See Figs. 7 and 8; and Col. 14, lines 36-42 (and the remainder of the discussion at Col. 14, line 43 to Col. 15, line 11).

Since neither Granfors or Watanabe disclose this element of Claim 7, withdrawal of the rejection of Claim 7 is respectfully requested. Claims 16, 25, and 35 recite limitations similar to Claim 7 and are allowable for reasons similar to Claim 7.

2. 53-55 and 58

Claims 53-55 and 58 depend from Claim 44 which recites “providing a pixel value for the defective pixel using the first, second, and third pixel values wherein the first pixel, the second pixel, and the third pixel selected may be different for each image.” Neither Granfors nor Watanabe teach this element of Claim 44. Rather, Granfors teaches that for each image, the pixels used to correct the defective pixel are always the same and are based on the codes set during the calibration phase. Col. 4, lines 54-60. Also, Watanabe teaches that for each

image, the pixels used to correct the defective pixel are always the same and are selected to be the eight pixels occupying the A11, A12, A13, A21, A23, A31, A32, and A33 positions with respect to the defective pixel for defective red and blue pixels, and the four pixels at a diagonal with respect to the defective pixel for defective green pixels. See Col. 14, lines 36-42 and Col. 15, lines 1-5.

Since Claims 53-55 and 58 recite at least one element not taught or suggested by Granfors, Watanabe, or the combination of those two patents, Claims 53-55 and 58 are believed to overcome the rejection based on Granfors in view of Watanabe.

3. 68-70

Claims 68-70 depend from Claim 59 which recites “analyzing a characteristic of each of a plurality of pixels, the characteristic for each of the plurality of pixels based on pixel values of the image; [and] selecting a first pixel of the plurality of pixels having a first pixel value based on the analyzed characteristic of the first pixel.” As discussed above, Granfors does not teach selecting a first pixel of the plurality of pixels having a first pixel value based on the analyzed characteristic of the first pixel where the characteristic for the first pixel is based on pixel values of the image received from the detector. Rather, Granfors teaches selecting which pixels will be used to provide a value for the defective pixel before a particular image is obtained based on a predetermined selection order and based on whether a particular pixel is defective (a property of the detector). Col. 4, lines 41-46 and 54-55.

Watanabe also fails to teach selecting a first pixel of the plurality of pixels having a first pixel value based on the analyzed characteristic of the first pixel where the characteristic for the first pixel is based on pixel values of the image received from the detector. Rather, Watanabe teaches selecting the eight pixels occupying the A11, A12, A13, A21, A23, A31, A32, and A33 positions with respect to the defective pixel for defective red and blue pixels, and the four pixels at a diagonal with respect to the defective pixel for defective green pixels. See Col. 14, lines 36-42 and Col. 15, lines 1-5.

Since Claims 68-70 recite at least one element not taught or suggested by Granfors, Watanabe, or the combination of Granfors in view of Watanabe, withdrawal of the rejection of Claims 68-70 is respectfully requested.

Claim Objections

Claims 49 and 64 were objected to on page 4 of the Office Action because the matrices A_i and H should be identified. Matrices A_i and H have been identified in those claims. These amendments to Claims 49 and 64 are believed to overcome the claim objections.

Conclusion

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

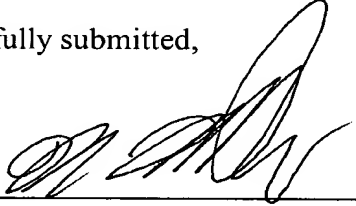
The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 07-0845. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 07-0845. If any extensions of time are needed for timely acceptance of

papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R.
§1.136 and authorizes payment of any such extensions fees to Deposit Account No. 07-0845.

Respectfully submitted,

Date 3-22-04

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